CLAIMS

1. A diffractive security element (2) having an optical waveguide (5) of a transparent dielectric integrated into a layer composite (1) and embedded between a transparent base layer (4) to be illuminated and a protective layer (6), wherein the dielectric differs in refractive index from the plastic material of the adjoining layers (4; 6) and in surface portions (21; 22; 25) bears closely against an optically effective structure (9) of an interface in relation to the base layer (4),

characterised in that

in the waveguide (5) the transparent dielectric is of uniform layer thickness (s) and is of a value of the refractive index of at least 2,

the waveguide is modulated by means of the optically effective structures (9) and the optically effective structure (9) as a base structure has a zero order diffraction grating with a diffraction grating vector (19), a period length (d) from the range of between 100 and 500 nm and a profile depth (t) from the range of between 20 nm and 1 μm,

the waveguide (5) is of a minimum length (L) of at least between 10 and 20 period lengths (d) of the zero order diffraction grating, and

in at least one of the surface portions (21; 22; 25) the profile depth (t) and the layer thickness (s) for modulation of the waveguide (5) are in one of the predetermined ratios $t \approx 3s$ or $s \approx t$ or $s \approx 2t$.

2. A diffractive security element (2) as set forth in claim 1 characterised in that the values of the period length (d), the profile depth (t) and the layer thickness (s) involve a tolerance of $\pm$ 5%.

3. A diffractive security element (2) as set forth in claim 1 or claim 2 characterised in that the layer thickness (s) is of values from the range of between 65 nm and 85 nm and the profile depth (t) is of values from the

range of between 60 nm and 90 nm and that a value from the range of between 260 nm and 370 nm is selected for the period length (d).

4. A diffractive security element (2) as set forth in claim 1 or claim 2 characterised in that the layer thickness (s) is selected at 115 nm, the profile depth (t) at 65 nm and the period length (d) at 345 nm.

5. A diffractive security element (2) as set forth in claim 1 or claim 2 characterised in that the layer thickness (s) is of a value of 60 nm, the profile depth (t) is of a value of 150 nm and the period length (d) is of a value of 417 nm.

6. A diffractive security element (2) as set forth in one of claims 1 through 5 characterised in that the base structure of the optically effective structure (9) is a diffraction grating comprising two mutually intersecting zero order diffraction gratings.

7. A diffractive security element (2) as set forth in claim 8 characterised in that the intersection angle of the zero order diffraction gratings is in the range of between 10° and 30°.

8. A diffractive security element (2) as set forth in one of claims 1 through 7 characterised in that the optically effective structure (9) is a superimposition of the base structure with a sawtooth-shaped relief structure (17) with the relief vector (20) and that the relief structure (17) has a spatial frequency (F) of smaller than the inverse of the minimum length of the waveguide (5).

9. A diffractive security element (2) as set forth in claim 8 characterised in that the sawtooth-shaped relief structure (17) is asymmetrical with a blaze angle (γ) and the blaze angle (γ) is of a value from the range of between 1° and 15°.

10. A diffractive security element (2) as set forth in claim 8 or claim 9 characterised in that the diffraction grating vector (19) and the relief vector (20) include an azimuth difference angle (ψ) with one of the values from the series 0°, 45°, 90° and so forth.

11. A diffractive security element (2) as set forth in one of claims 1 through 10 characterised in that ZnS or TiO_2 is used as the dielectric of the waveguide.

12. A diffractive security element (2) as set forth in one of claims 1 through 11 characterised in that the waveguides (5) of the surface portions (21; 22) differ in the optically effective structure (9).

13. A diffractive security element (2) as set forth in one of claims 1 through 12 characterised in that the waveguides (5) of the surface portions (21; 22; 25) differ in respect of the azimuthal orientation of the diffraction grating vectors (19).

14. A diffractive security element (2) as set forth in claim 12 or claim 13 characterised in that the diffraction grating vector (19) of the one surface portion (21) is oriented orthogonally with respect to the diffraction grating vector (19) of one of the other surface portions (22; 25).

15. A diffractive security element (2) as set forth in one of claims 1 through 14 characterised in that arranged in the surface portions (21; 22; 25) are field portions (26) with grating structures having spatial frequencies in the range of between 300 lines/mm and 1800 lines/mm and azimuth angles in the range of between 0° and 360°.